WHAT IS CLAIMED IS:

1 A method for the space-time filtering of in radiography comprising:

a. for each pixel having coordinates (x,y) of a first image, a weighting is performed on the coefficients U(k,l) of a first convolution core with a dimension D, equivalent to a low-pass filter, as a function of a coefficient G which is a function of the difference computed between I(x,y) and I(x+k, y+l), where I(x,y) is the intensity of the pixel with coordinates (x,y) of the first image, and k and l are indices used to explore the coefficients of the convolution core, a second convolution core with coefficients Up(k,l) being thus obtained;

b. for each pixel with coordinates (x,y) of the first image, a weighting is performed on the coefficients U(k,l) of the first convolution core as a function of the coefficient G which is a function of the difference computed between I(x,y) and I'(x+k, y+l), where I'(x,y) is the intensity of the pixel with coordinates (x,y) of a second image, a third convolution core with coefficients Up'(k,l) being thus obtained; and

c. the filtered value of I(x,y) is computed by the formula:

$$F(x,y) = \left(\sum_{k=-L}^{L} \sum_{l=-L}^{L} \left(\gamma * Up(k,l).I(x+k,y+l) + (1-\gamma) * Up'(k,l).I'(x+k,y+l) \right) \right) / N \text{.....(1)}$$

$$L = {(D-1)}/{2} \text{.....(2)}$$

$$\gamma \in [0,1] \text{....(3)}$$

$$N = \sum_{k=-L}^{L} \sum_{l=-L}^{L} \left(\gamma * Up(k,l) + (1-\gamma) * Up'(k,l) \right) \text{.....(4)}$$

where F(x,y) is the filtered value of I(x,y).

2. The method according to claim 1 wherein:

Up(k,l) = U(k,l)xG(I(x+k,y+l)-I(x,y); σ(I(x,y))); and

U'p(k,l) = U(k,l)xG(I'(x+k,y+l)-I(x,y); λ.σ(I(x,y)))

with G as a weighting function depending on a difference between the value of the

pixel to be filtered and its neighborhood and depending on a noise statistic for the value of the pixel to be filtered.

3. The method according to claim 2 wherein G is a function of the difference ε computed and of a known noise statistic σ for I(x,y), the coefficient G being then written as the function G(ε, σ), where G is therefore the value in terms of ε of a Gaussian curve centered on 0 and having a standard deviation σ.

4. The method according to claim 2 wherein G is a function of the computed difference ε of the following type:

G(ε) = -a. ε + 1, with a > 0, et
Up(k,l) = U(k,l)xG(I(x+k,y+l)-I(x,y)), and
U'p(k,l) = U(k,l)xG(I'(x+k,y+l)-I(x,y)).

5. The method according to claim 2 wherein λ is a real number.

6. The method according to claim 3 wherein λ is a real number.

7. The method according to claim 4 wherein λ is a real number.

8. The method according to claim 1 wherein equation (1) becomes:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma) * Up'(k,l).F'(x+k,y+l)\right)\right)/N$$

where F'(x,y) is the filtered intensity of the pixel with coordinates (x,y) of the second image.

9. The method according to claim 2 wherein equation (1) becomes:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma) * Up'(k,l).F'(x+k,y+l)\right)\right)/N$$

where F'(x,y) is the filtered intensity of the pixel with coordinates (x,y) of the second image.

10. The method according to claim 3 wherein equation (1) becomes:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma) * Up'(k,l).F'(x+k,y+l)\right)\right)/N$$

where F'(x,y) is the filtered intensity of the pixel with coordinates (x,y) of the second image.

11. The method according to claim 4 wherein equation (1) becomes:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma) * Up'(k,l).F'(x+k,y+l)\right)\right)/N$$

where F'(x,y) is the filtered intensity of the pixel with coordinates (x,y) of the second image.

12. The method according to claim 5 wherein equation (1) becomes:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma) * Up'(k,l).F'(x+k,y+l)\right)\right)/N$$

where F'(x,y) is the filtered intensity of the pixel with coordinates (x,y) of the second image.

13. The method according to claim 1 wherein a value of γ equal to 0 implies a zero temporal dependence.

14. The method according to claim 2 wherein a value of γ equal to 0 implies a zero temporal dependence.

15. The method according to claim 3 wherein a value of γ equal to 0 implies a zero temporal dependence.

16. The method according to claim 4 wherein a value of γ equal to 0 implies a zero temporal dependence.

17. The method according to claim 5 wherein a value of γ equal to 0 implies a zero temporal dependence.

18. The method according to claim 8 wherein a value of γ equal to 0 implies a zero temporal dependence.

19. The method according to claim 1 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

20. The method according to claim 2 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

21. The method according to claim 3 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

22. The method according to claim 4 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

23. The method according to claim 5 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

24. The method according to claim 8 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

25. The method according to claim 13 wherein the first and second images are successive images of a sequence of images, the first image having a date t, and the second image having a date t-1.

26. The method according to claim 1 wherein D is equal to 5.

27. The method according to claim 2 wherein D is equal to 5.

28. The method according to claim 3 wherein D is equal to 5.

29. The method according to claim 4 wherein D is equal to 5.

30. The method according to claim 5 wherein D is equal to 5.

31. The method according to claim 8 wherein D is equal to 5.

32. The method according to claim 13 wherein D is equal to 5.

33. The method according to claim 19 wherein D is equal to 5.

34. The method according to claim 1wherein D is greater than 5.

35. The method according to claim 2 wherein D is greater than 5.

36. The method according to claim 3 wherein D is greater than 5.

37. The method according to claim 4 wherein D is greater than 5.

38. The method according to claim 5 wherein D is greater than 5.

39. The method according to claim 5 wherein D is greater than 5.

40. The method according to claim 8 wherein D is greater than 5.

41. The method according to claim 19 wherein D is greater than 5.

42. The method according to claim 26 wherein D is greater than 5.

43. The method according to claim 1 wherein D is an odd number.

44. The method according to claim 2 wherein D is an odd number.

45. The method according to claim 3 wherein D is an odd number.

46. The method according to claim 4 wherein D is an odd number.

47. The method according to claim 5 wherein D is an odd number.

48. The method according to claim 8 wherein D is an odd number.

49. The method according to claim 13 wherein D is an odd number.

50. The method according to claim 19 wherein D is an odd number.

51. The method according to claim 26 wherein D is an odd number.

52. The method according to claim 34 wherein D is an odd number.

53. A space-time convolution filter designed according to the method of claim 1.

54. A scanner for radiography having a filter according to claim 53.

55. A computer program comprising computer program code means, the computer readable program code means for causing a computer to provide:

a. for each pixel having coordinates (x,y) of a first image, a weighting is performed on the coefficients U(k,l) of a first convolution core with a dimension D, equivalent to a low-pass filter, as a function of a coefficient G which is a function of the difference computed between I(x,y) and I(x+k, y+l), where I(x,y) is the intensity of the pixel with coordinates (x,y) of the first image, and k and l are indices used to explore the coefficients of the convolution core, a second convolution core with coefficients Up(k,l) being thus obtained;

b. for each pixel with coordinates (x,y) of the first image, a weighting is performed on the coefficients U(k,l) of the first convolution core as a function of the coefficient G which is a function of the difference computed between I(x,y) and I'(x+k, y+l), where I'(x,y) is the intensity of the pixel with coordinates (x,y) of a second image, a third convolution core with coefficients Up'(k,l) being thus obtained; and

c. the filtered value of I(x,y) is computed by the formula:

$$F(x,y) = \left(\sum_{k=-L}^{L} \sum_{l=-L}^{L} \left(\gamma * Up(k,l).I(x+k, y+l) + (1-\gamma) * Up'(k,l).I'(x+k, y+l) \right) \right) / N .....(1)$$

$$L = {(D-1)}/{2} .....(2)$$

$$\gamma \in [0,1] ....(3)$$

$$N = \sum_{k=-L}^{L} \sum_{l=-L}^{L} \left(\gamma * Up(k,l) + (1-\gamma) * Up'(k,l) \right) ....(4)$$

where F(x,y) is the filtered value of I(x,y).

56. A computer program product comprising a computer useable medium having computer readable program code means embodied in the medium, the computer program product comprising:

a. computer readable program code means embodied in the medium for causing a computer to provide for each pixel having coordinates (x,y) of a first image, a weighting is performed on the coefficients U(k,l) of a first convolution core with a dimension D, equivalent to a low-pass filter, as a function of a coefficient G which is a function of the difference computed between I(x,y) and I(x+k, y+l), where I(x,y) is the intensity of the pixel with coordinates (x,y) of the first image, and k and l are indices used to explore the coefficients of the convolution core, a second convolution core with coefficients Up(k,l) being thus obtained;

b. computer readable program code means embodied in the medium for causing a computer to provide for each pixel with coordinates (x,y) of the first image, a weighting is performed on the coefficients U(k,l) of the first convolution core as a function of the coefficient G which is a function of the difference computed between I(x,y) and I'(x+k, y+l), where I'(x,y) is the intensity of the pixel with coordinates (x,y) of a second image, a third convolution core with coefficients Up'(k,l) being thus obtained; and

c. computer readable program code means embodied in the medium for causing a computer to provide the filtered value of I(x,y) is computed by the formula:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma)*Up'(k,l).I'(x+k,y+l))\right)/N.....(1)$$

$$L={(D-1)}\!\!\Big/_{2}.....(2)$$

$$\gamma\in[0,1]....(3)$$

$$N=\sum_{k=-L}^{L}\sum_{l=-L}^{L}(\gamma * Up(k,l)+(1-\gamma)*Up'(k,l))....(4)$$

where F(x,y) is the filtered value of I(x,y).

57. An article of manufacture for use with a computer system, the article of manufacture comprising a computer readable medium having computer readable program code means embodied in the medium, the program code means comprising:

a. computer readable program code means embodied in the medium foor causing a computer to provide for each pixel having coordinates (x,y) of a first image, a weighting is performed on the coefficients U(k,l) of a first convolution core with a dimension D, equivalent to a low-pass filter, as a function of a coefficient G which is a function of the difference computed between I(x,y) and I(x+k, y+l), where I(x,y) is the intensity of the pixel with coordinates (x,y) of the first image, and k and l are indices used to explore the coefficients of the convolution core, a second convolution core with coefficients Up(k,l) being thus obtained;

b. computer readable program code means embodied in the medium foor causing a computer to provide for each pixel with coordinates (x,y) of the first image, a weighting is performed on the coefficients U(k,l) of the first convolution core as a function of the coefficient G which is a function of the difference computed between I(x,y) and I'(x+k, y+l), where I'(x,y) is the intensity of the pixel with coordinates (x,y) of a second image, a third convolution core with coefficients Up'(k,l) being thus obtained; and

c. computer readable program code means embodied in the medium foor causing a computer to provide the filtered value of I(x,y) is computed by the formula:

$$F(x,y)=\left(\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l).I(x+k,y+l)+(1-\gamma) * Up'(k,l).I'(x+k,y+l)\right)\right)/N.....(1)$$

$$L={(D-1)}\big/_{2}.....(2)$$

$$\gamma\in[0,1]....(3)$$

$$N=\sum_{k=-L}^{L}\sum_{l=-L}^{L}\left(\gamma * Up(k,l)+(1-\gamma) * Up'(k,l)\right).....(4)$$

where F(x,y) is the filtered value of I(x,y).